SHORTENING— Its Baking Function

Selection of Proper Shortening Material and Its Use in Suitable Manner and Quantity of Highest Importance in Production of Bakery Products

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IT WOULD be quite impossible to fully cover the subject assigned me in the short time available. I will, therefore, confine my remarks to the use of shortening in the commercial bakeshop and cover as many of the individual bakeshop products as the time will permit. It is interesting in passing to note the advances which have been made in recent years in the baking industry. Only a comparatively few years ago, the baker just baked. His equipment was unsatisfactory. He paid little attention to the quality of ingredients used or to the methods of mixing followed in the shop. The main object at that time appeared to be to get the product out of the oven regardless of the quality. As a result of these conditions, the bakery business was far from profitable. Eighty percent of the bread consumed was baked in the home because the baker's product was of such poor quality that the houselife would not buy it. The leaders of the industry, urged on by the competition of the housewife, launched a campaign having for its purpose the transfer of bread baking activities from the kitchen to the commercial bakeshop. That this campaign was entirely successful is evidenced by the fact that today over eighty percent of the bread consumed is produced in the commercial shop and less than twenty percent in the kitchen. Women who bake bread now are considered old-fashioned indeed and this is really as it should be. There are too many worth while activities available to the women of the present day to ask them to spend their time in the kitchen making bread or any other baked product. The story of "The capture of the bread business from the housewife," as I like to call it, is an extremely interesting one. Education of the individual baker was the principal means of accomplishing the desired result. It was impressed upon him through every possible channel that he was getting only a small part of the possible business. He was then informed as to the quality of ingredients necessary to make a loaf which would be comparable to that made in the kitchen by the housewife. The methods of mixing and baking were improved and standardized. The result of this educational campaign was that the time came eventually when the lady of the house could purchase a loaf of bread over the bakery counter which was equal or even superior to her own. She, therefore, gladly conceded the struggle for supremacy in bread baking to the commercial shop. Unfortunately, this same statement cannot be made with respect to cake. Approximately eighty percent of the cake consumed in this country today is now baked in the home. The cake baker has the same problem now that the bread baker had fifteen years ago. He must improve the quality of the cake which he offers the housewife until it is equal or superior to the one which she now prepares for the family herself. Then and then only will the product of the commercial shop replace that of the kitchen oven.

I bring these facts to your attention because we as producers of materials used in baking have a definite duty to perform in connection with the bakers' problems. We must first furnish quality ingredients most suitable for the purpose intended. If the baker is to compete with the housewife's cake, for example, he must use ingredients of the same quality and also of the same character as she does. If a shortening with a characteristic flavor will produce a better baked product than one with

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no flavor then we should so inform the baker if we are to help him increase his business. We must always remember that there is no universal shortening. There is, however, a certain definite type of shortening which may be selected as most satisfactory for each definite bakeshop product and we should see to it that the baker makes this selection from facts rather than from high pressure salesmanship or claims which cannot be substantiated. We must also assist the baker in developing types of cake, in improving his methods of mixing, and even in the merchandising methods which he may use in putting across to the housewife his story of improved product. His problems are our problems for as we help him increase his distribution we are creating a greater demand for our own products.

Qualities of Bread

BREAD may well be the first bakery product to consider. The principal ingredients used in its manufacture are flour, water, yeast, sugar, shortening and salt. The framework of the loaf is the gluten which is formed from the protein of the flour, and the leavening agent is the carbon dioxide gas produced from the fermentation of the sugar by the yeast. The amount of shortening used in bread will vary from two to three percent, based, as the baker calculates percentage, on the basis of the flour. Sliced bread, which just now enjoys a quite extensive distribution, carries a somewhat higher percentage in order that drying out or staling may be delayed. It is found that the total score of the loaf increases rapidly up to two percent of shortening. From two to three percent there is a somewhat slower improvement which is followed by a rapid decline. The small percentage of shortening present in bread does not, of course, permit of any startling effects upon the loaf. There is, however, a noticeable improvement in the character of the crust with the increase in shortening content. A loaf baked without shortening would have an extremely brittle crust. This brittleness decreases with the addition of shortening and is replaced by the much desired tender crust which results from the lubricating effect of the fat. Shortening very materially reduces the loss in weight which takes place in the first few hours after the loaf is baked. This leads to an improved keeping quality which enables the commercial baker to put his loaf on the consumer's table with a freshness equal to that which would be found in the loaf baked in the kitchen oven by the housewife. Shortening improves the crust color. It adds a very desirable brilliancy to the golden brown color produced by the caramelizing of the sugar in the oven heat. The texture of the loaf is rapidly improved up to two percent shortening with a slower improvement with additional amounts. The crumb of bread made without shortening is harsh and rough but the addition of shortening in proper amounts leads to a very desirable, smooth, silky texture which is quite marked when taken into the mouth and might well be called "chewability." If a shortening such as lard which carries a characteristic flavor is used in bread the flavor as such does not carry through into the finished baked loaf. Salt, sugar, malt, and yeast, however, all lose their individuality in the loaf but all contribute toward the final flavor. The same is true of lard. Many of the important bread bakers prefer lard because it not only produces a very satisfactory pliable crust and a smooth, silky texture but also improves the flavor of the finished loaf.

Bakery Specialties

NEXT, let us consider the doughnut because this is a doughnut month and the start of that season of the year in which this product contributes quite appreciably to the income of the commercial bakeshop. Shortening is used in the dough batch and also as the frying medium with this class of bakery products. The fat, as in the case of bread, contributes to the texture of the product and produces that desirable chewability. It does not, however, contribute toward the flavor or taste because of the high seasoning usually used in this type of baked goods. Baking powder furnishes the leavening in the making of doughnuts and the cooking is accomplished in deep fat which is maintained at a temperature of 380° to 390° F. The shortening to successfully carry out its function as a frying fat must have a high smoke point so that it will not give off appreciable fumes at the temperature of frying and must be resistant to oxidation so that it will retain its life under the quite unfavorable conditions to which it is exposed.

Cake is probably the most interesting bakeshop product which we will consider in discussing the function of shortening. It is surprising, indeed, to search the literature and find so little material covering the fundamentals of cake making. As stated earlier, the baker enjoys only a small part of the possible business in this class of bakery products. Much work is being done, however, in the effort to change this condition and this work will undoubtedly be eventually successful. Before the goal is reached, however, the housewife must be convinced that the cakes she carries home from the corner shop are as good as those she has made with her own hands. She must be relieved of the suspicion that the ingredients used

in the bakeshop are of inferior quality and not marketable as first-grade products. She must not be asked to serve a product which reeks of cheap flavor. The goods must be presented to her in an attractive manner and in a fresh condition. All of these requirements are of extreme importance to the baker especially at the present time and must constantly be kept in mind when considering any phase of the baking business. With this picture before us, let us consider briefly the production of cake and the role which shortening does and will play in the struggle for the housewife's business.

Class of Cakes

THERE are three general methods of producing cakes. We have that class which depend upon beaten eggs for their lightness and are known as sponge cakes. The small percentage of shortening which is used in this type adds considerably to the eating quality. Then there is that class which makes use of an inorganic leavening agent in addition to creamed shortening and beaten eggs. The layer and loaf cakes are usually found in this class. Last, and most important of all, is that group of products which depends for its lightness upon the creaming and emulsifying power of the shortening. The procedure followed in making a cake of this latter class is to place the sugar and shortening in the bowl and incorporate air by creaming or mixing. This forms a foamy mass, the volume of which is, in the case of certain shortenings, more than double the volume of the original mass. When the sugar-shortening mixture has been sufficiently creamed, the eggs, milk, and flour are added in such a way that the foamy structure is not broken down. The dough going into the oven, therefore, contains finely distributed particles of air and moisture. The air, of course, when exposed to the heat of the oven expands and thus partially explains the increase in volume of the cake. This expansion was formerly taken to be entirely responsible for the cake volume. It has been recently pointed out, however, that the maximum expansion possible of the air present in the cake batter under the conditions of increased temperature taking place in the oven falls short by a considerable volume of accounting for the expansion which actually takes place in a cake made without chemical leavening. This means then that some other factor must enter into the leavening action. It is apparent that the vaporization of the moisture contributes more to the final cake volume than the expansion of the air. Shortening plays a very important part in the building of a batter which will produce the most satisfactory results. It furnishes a medium for holding air in the creamed mass. It also assists in building up a satisfactory cell structure so that the water may be distributed in such form that its vaporization may produce not only maximum volume but also even grain. It is quite probable that the so-called creaming qualities of a shortening have in the past been overemphasized. The mere ability of a shortening to give maximum volume when creamed with sugar does not necessarily indicate that it is the most suitable for cake work. Its ability when creamed with other ingredients to render the greatest assistance in the holding of air and water in suitable cell structure is the important function. There are, of course, a number of factors in the treatment of the shortening-sugar mass which will appreciably influence the final results regardless of the ability of the shortening to cream and build up cell structure. Among the more important of these are temperature, speed of mixing machine, granulation of sugar used, and rate of addition of other ingredients. It is interesting to note in this connection that as more and more attention and thought are being given to the baker's problems in cake making, particularly by the technical men of the Allied Trades, that the older ideas and methods are being seriously questioned. For example, it has been believed that the proper method for producing pound cake must start with the creaming of the sugar-shortening mixture. Today there is a school which holds that this operation is unnecessary and that the same results may be obtained with much less trouble and with more uniformity by placing all of the ingredients together in the bowl and mixing to the proper consistency. The work on this method in our own Experimental Bakery has indicated several serious objections, the principal one being loss of volume. Another method of handling cake mixes has been proposed recently and appears to offer much promise. I refer to the mixing of the batter under pressure. We have been able to produce a very satisfactory cake with this method and find that a very close control of the finished cake characteristics may be secured by controlling the specific gravity of the finished cake batter.

It is quite possible that the creaming and cell forming function of shortening will continue to be fundamental in the new methods of mixing which are being brought to the attention of the baking industry. On the other hand it is within the realm of possibility that the old theory will be completely overturned and shortening made to play an entirely different

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role. The suggestion comes from many sides that we are on the verge of a revolutionary change in cake mixing methods. We, as technical representatives of the oil and fat industry, must be alive to the possibilities.

Before leaving the the subject of cake it might be well to state that hydrogenated fats and butter are the two shortenings which have found favor in this field. The hydrogenated products are quite satisfactory because of their bland flavor, their consistency, and their ability to build up a cell structure which gives the desired volume together with good texture. Butter is used principally for the flavor imparted to the finished baked product. The actual shortening power of butter is only eighty percent that of the all-fat products because of its moisture and milk solids content. It is, however, one of the housewife's most important ingredients and is used by the majority of commercial shops producing quality cakes.

Other Bakery Products

NO discussion of bakeshop products would be complete unless the subject of pies was considered. Three-fourths of the desserts served to men in hotels and restaurants is said to be pie. This proportion does not hold true in the case of women as the estimate claims only one-fourth for them. It appears again that the woman is not sold on the baker's products. Pie crusts are made from flour, shortening, water, and salt, with the percentage of shortening varying from thirty to one-hundred percent on the basis of the flour. Shortening is defined in the dictionary as "that which shortens; especially some product as lard or butter which makes pastry crisp." This definition is well illustrated in the case of pie crusts. Here we have a comparatively large amount of fat present which functions primarily as a lubricant. The distribution of the fat largely determines the type of crust. If the shortening is intimately mixed in the dough so that each particle of flour is surrounded by a layer of fat, then we have the mealy type of crust. If, on the other hand, the shortening and flour are mixed very little then the flaky crust results. A combination of the two methods of mixing will produce a crust with properties between the mealy type and the flaky type. Lard, hydrogenated shortenings, and compound shortenings are all used in pie work. Lard is especially satisfactory because it produces a slightly greater degree of "shortness" and in addition leads to a very desirable flavor in the baked crust.

My time will permit only the mention of several other important classes of bakery products in which shortening plays an extremely important part. Crackers made from a yeast-raised dough and containing an appreciable shortening content, owe their characteristic crispiness to the extremely fine film of fat which surrounds the particles of the other solid ingredients. Danish Pastry, a yeast-raised dough containing shortening in the dough and also having a special roll-in shortening usually in the form of margarine worked into the dough in layers, gives us the coffee cakes and butter biscuits. Puff Pastry depends entirely upon shortening rolled in between layers of dough for its lightness and richness. Turnovers, cream slices, cream roll horns, and patty shells are examples of this class of bakery product.

We have now considered practically every important class of bakery product, and I have tried to describe enough of the method of making these products to bring out the part which shortening plays in them. In conclusion, I would call to your attention a very unfortunate situation. We have no generally accepted definite absolute methods which may be used in evaluating a shortening for bakeshop purposes. The indications of a good flour are very plain. The determinations of moisture, protein, ash, and quality of gluten together with a fairly dependable baking test makes the selection of a flour comparatively simple. Microscopic, analytical, and baking tests furnish a quite accurate control of the yeast. A polariscope reading, screen test, and examination for impurities settles the grade of the sugar. The standardization of the malt, diastatic and otherwise, is not difficult. The percentage of sodium chloride furnishes the criterion for salt. An exact analytical result and solubility test can be obtained on the various milk products. But how do we select a shortening with respect to its ability to do certain work in the bakeshop? We determine the usual constants such as melting point, softening point, iodine number, etc. and are apparently satisfied. It is quite possible that the time is not far distant when we will have to develop and accept scientific and standardized methods for the more indefinite properties such as creaming power, emulsification ability, and shortening power.

Scouring compositions may be formed by adding to soaps, abrasives, etc., a mixture of trisodium phosphate with saponon or sodium sesquicarbonate or both. Brit. Pat. No. 326,755.